ERDC's Coastal Storm-Modeling System: System Integration (CSTORM-MS)

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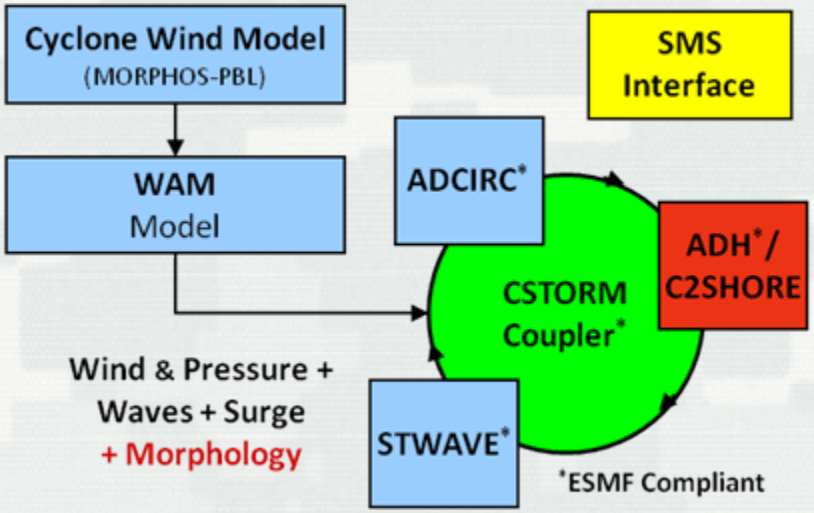
12th International Workshop on Wave Hindcasting and Forecasting and 3rd Coastal Hazards Symposium (WAVES)

Kohala Coast, Hawaii Oct 30-Nov 4, 2011

CSTORM-MS Overview

- CSTORM-MS is an efficient, robust, expandable modeling system for assessing the risk of flooding of coastal communities …. or non-storm events
- Streamlined workflow saves time and reduces both computational and personnel cost.
- Model data stored in CSTORM-DB for easy access and reuse purposes….for example…



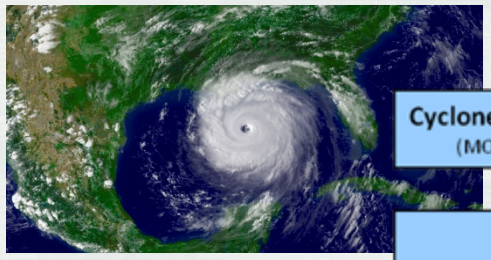
Spiral 2 coming FY12

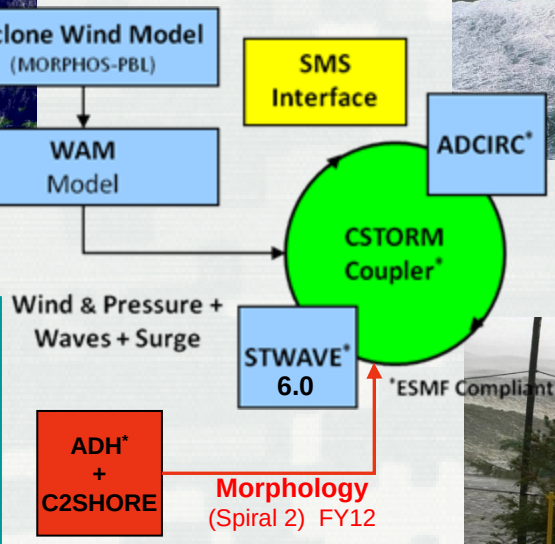
ERDC's Coastal Storm-Modeling System

(ERDC CSTORM-MS)

Application of high-resolution, highly skilled numerical models in a tightly-integrated modeling system with user friendly interfaces

Not just hurricanes and not just in the Gulf of Mexico.





Next Generation Workflow

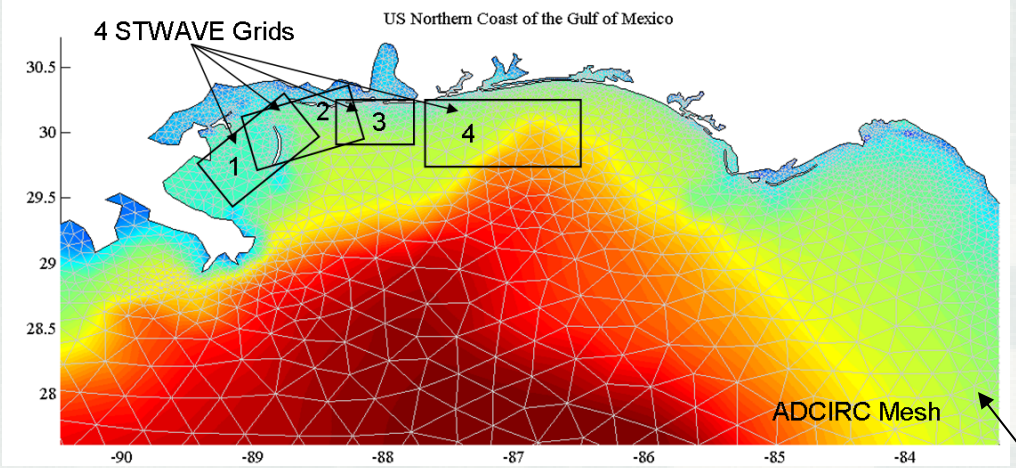
Expandable and upgradeable system.

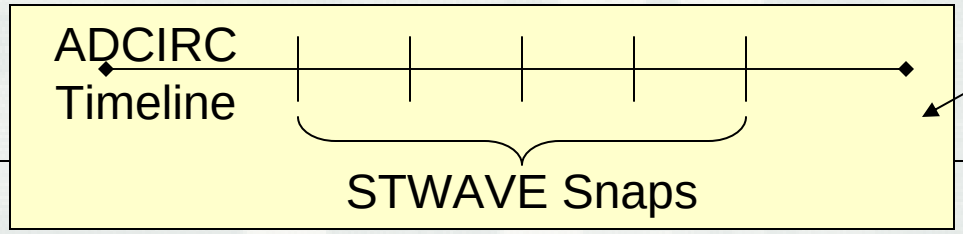
Provides for a robust, standardized approach to establishing the risk of inundation to coastal communities from storm events

BUILDING STRONG®

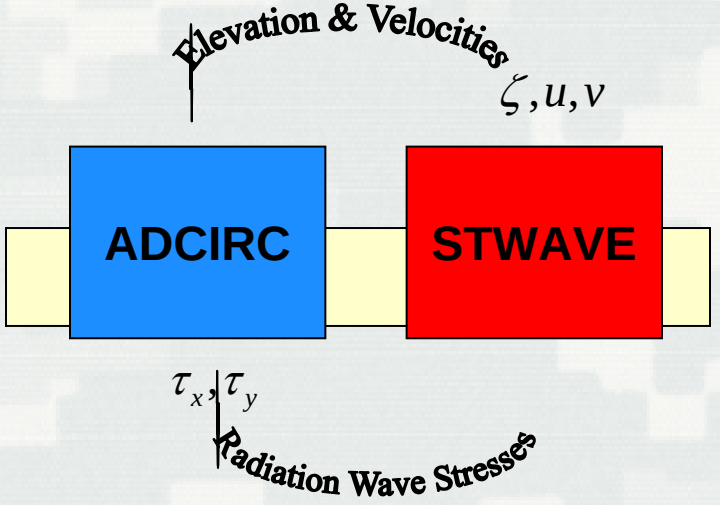
Circulation ←→ Wave Coupling

- Unstructured finite element circulation mesh
  - Single ADCIRC domain
- One or more structured wave grids
  - Multiple STWAVE domains
    - Half-Plane
    - Full-Plane





Information to Exchange



For consistency use the same winds and bathymetry.

Need to be able to synchronize both time and spatial frames of reference.

The Earth System Modeling Framework

- The ESMF has multi-agency buy in.

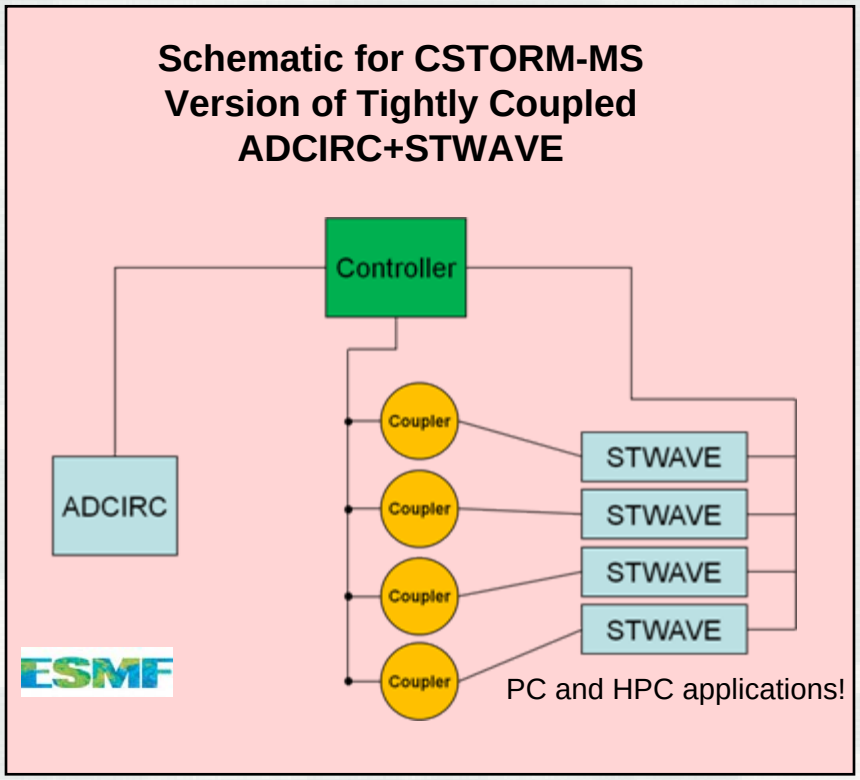
- Having our models ESMF compliant makes them readily available to be linked with each other and with other agencies' ESMF compliant models.

- This leads to expanded collaborations and funding opportunities.

ESMF

Circulation ←→ Wave Coupling

CONTROL



ESMF coupling standards allows individual codes to stay virtually autonomous

Specification of how the two models are to interact is done with a simple control file

Controller: 1 cpu
Coupler: 1 cpu (1 coupler/STWAVE)
ADCIRC/STWAVE share cpu's

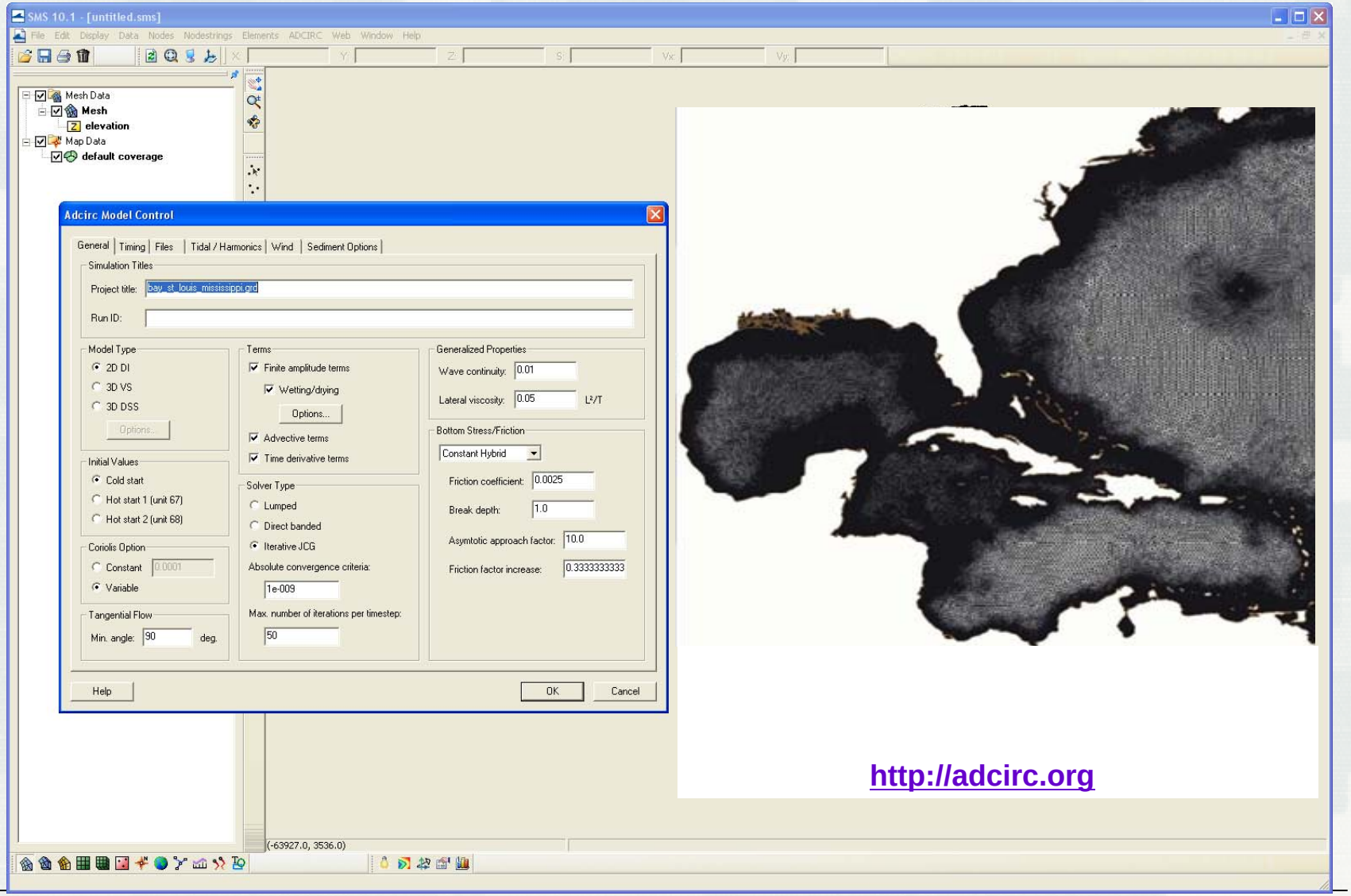
Example Lake Michigan/FEMA Study

ADCIRC: 157
STWAVE: 30 + 30 +120 = 180
Controller: 1
Couplers: 3
Total Needed: 184 shared CPUS

Expandable !

SMS GUI for ADCIRC

Coastal Circulation and Storm Surge Model



http://adcirc.org

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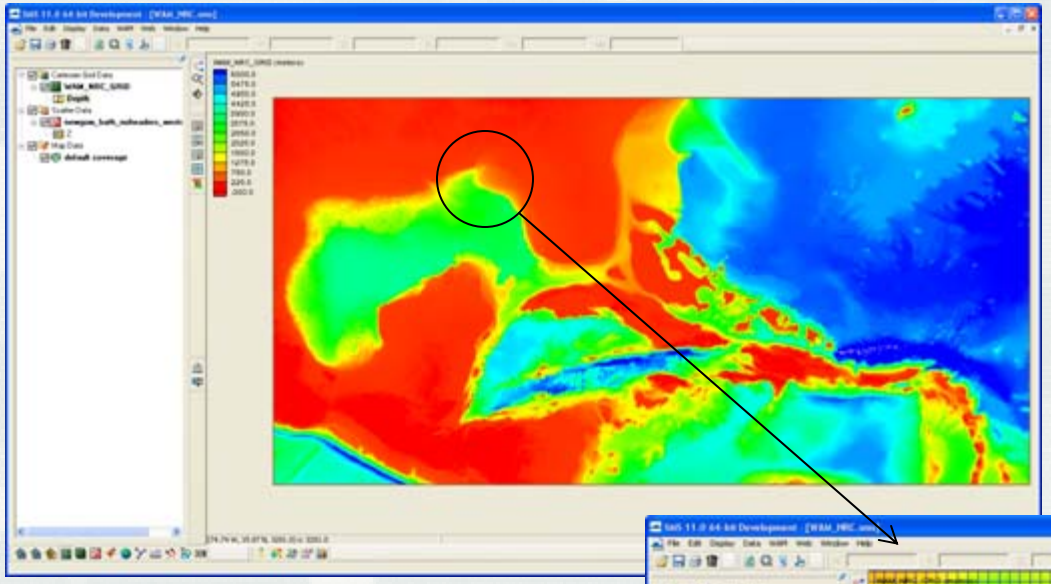
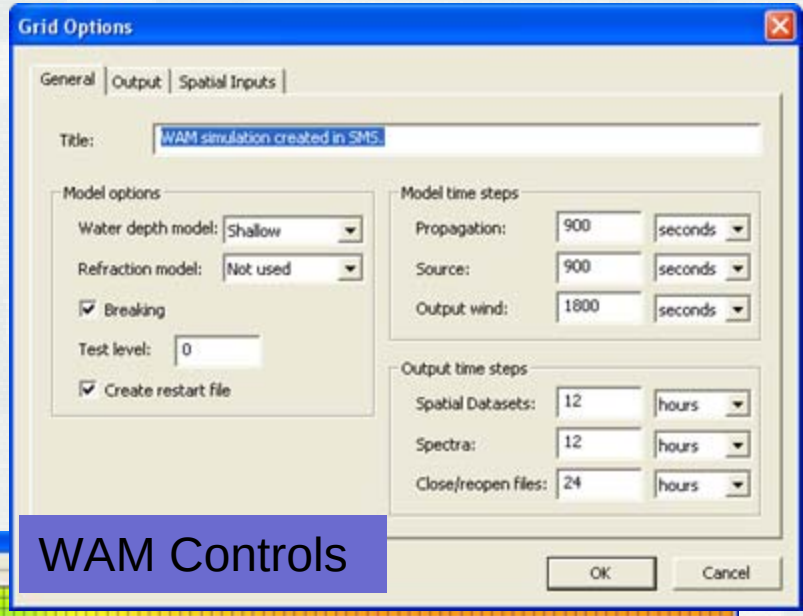
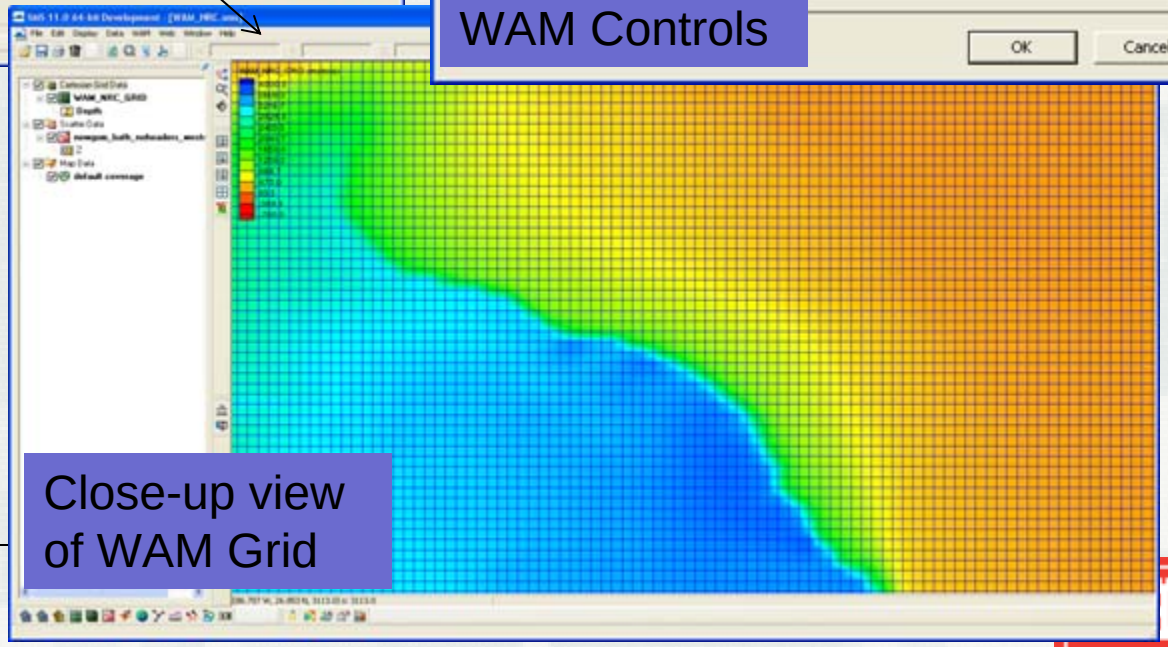
SMS GUI for WAM

Third generation global ocean wave prediction model





WAM Controls



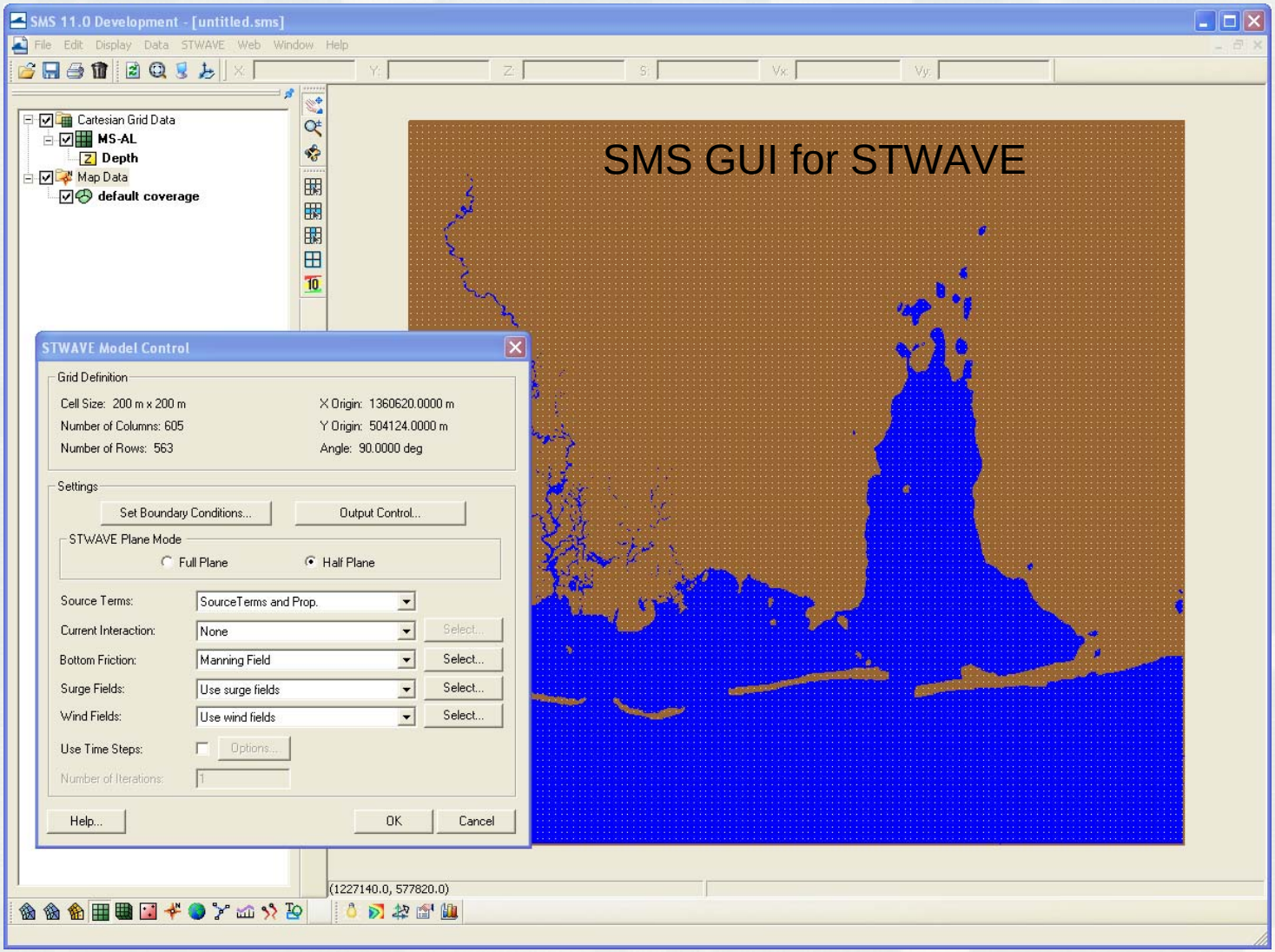
Close-up view of WAM Grid

New!! in SMS

- Create and visualize WAM grids and model results
- Setup input/control files
- Execute WAM

STWAVE Version 6.0

Nearshore wave transformation and wind-wave generation



STWAVE Version 6.0

Full-plane mode:

wave transformation/generation on full 360-deg plane

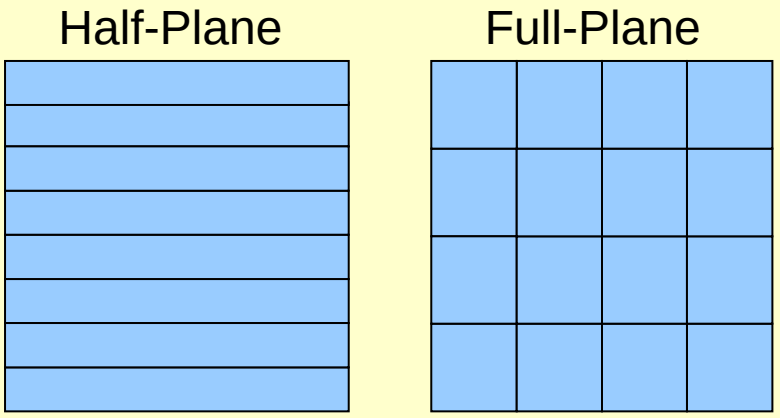
Additional Options with 6.0:

- Spatially-variable winds and surge
- Spatially-constant or spatially-variable bottom friction
- Lateral boundaries

STWAVE Version 6.0

- Both the half-plane and full-plane version of STWAVE have been parallelized in space via domain decomposition
- Allows for larger grids to be used, either to cover more area or to offer finer resolution…also speeds up execution time
- Half-plane and full-place codes co-located into a single executable
- Model parameter input files have been updated and unified

Domain Decompositions



Full-Plane S Grid

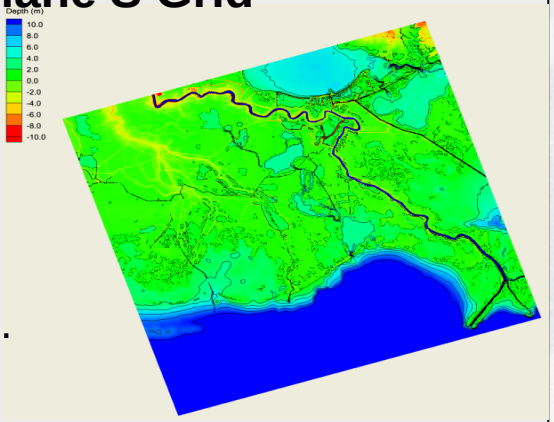
825 x 839 cells

Time for 1 Snap

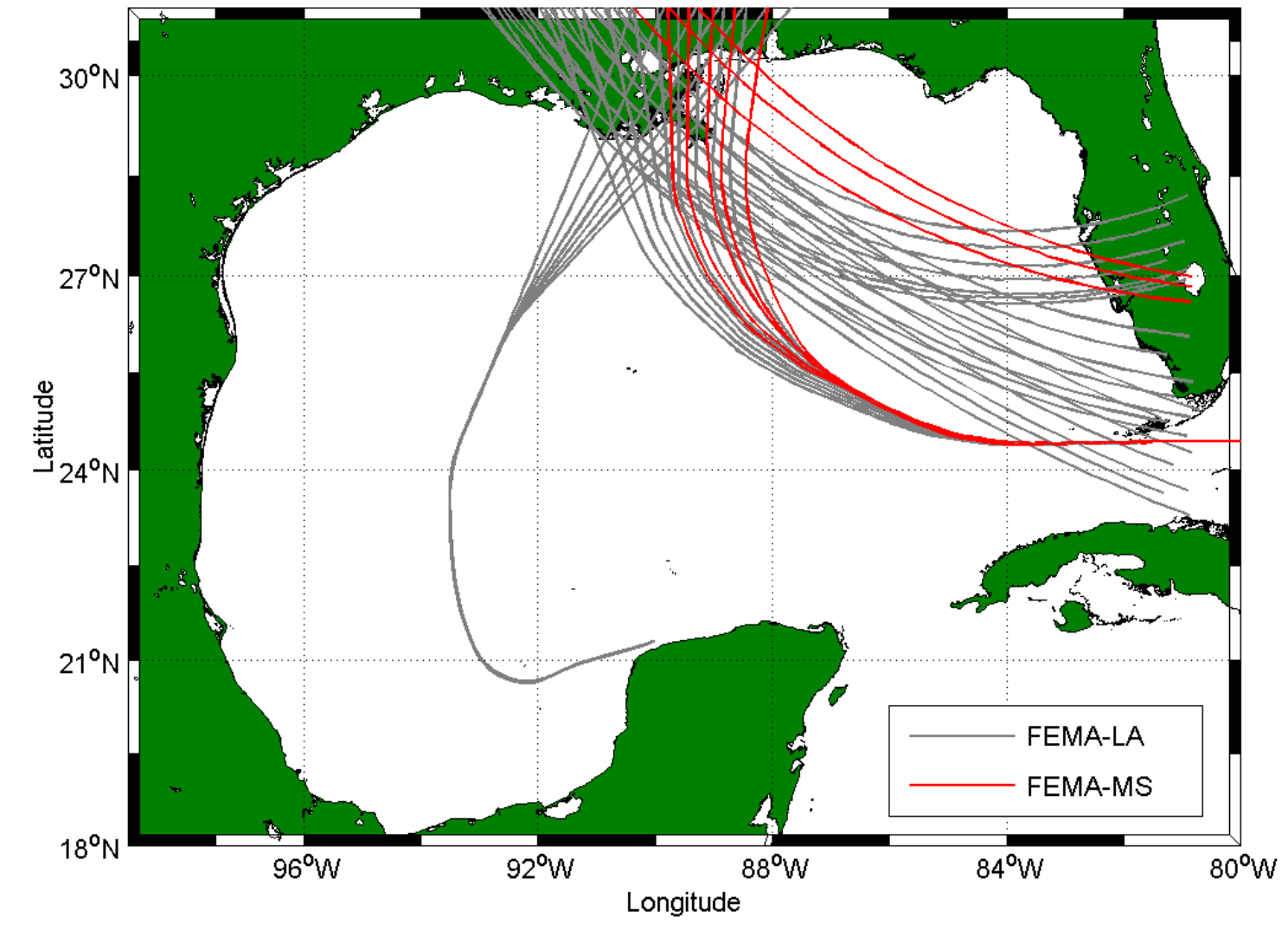
Serial* – 2 hours

256 Proc. – 3.8 min.

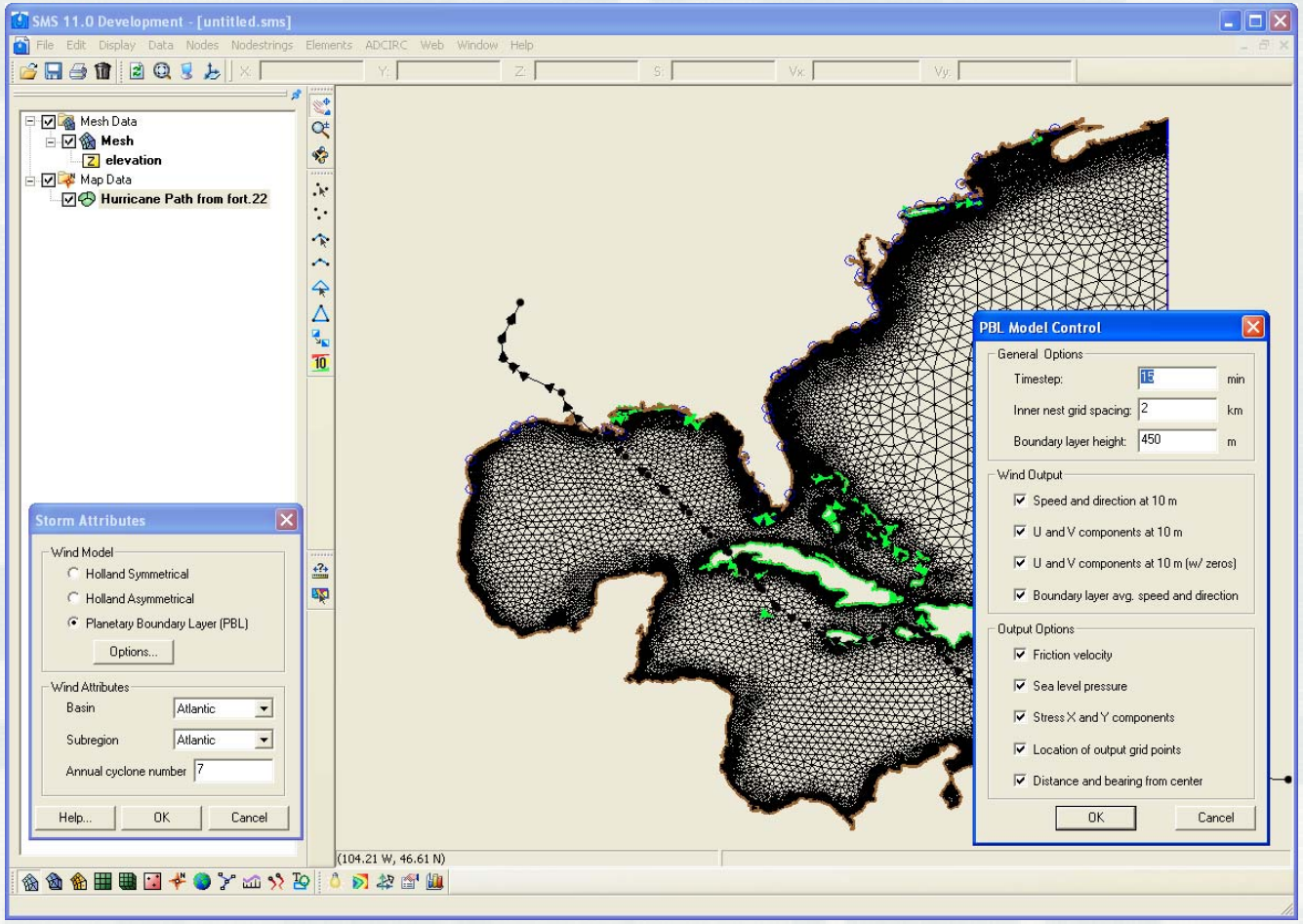
*(14 Gb of Memory)



Storm Tracks – Eastern LA & MS



SMS GUI for Cyclone Models

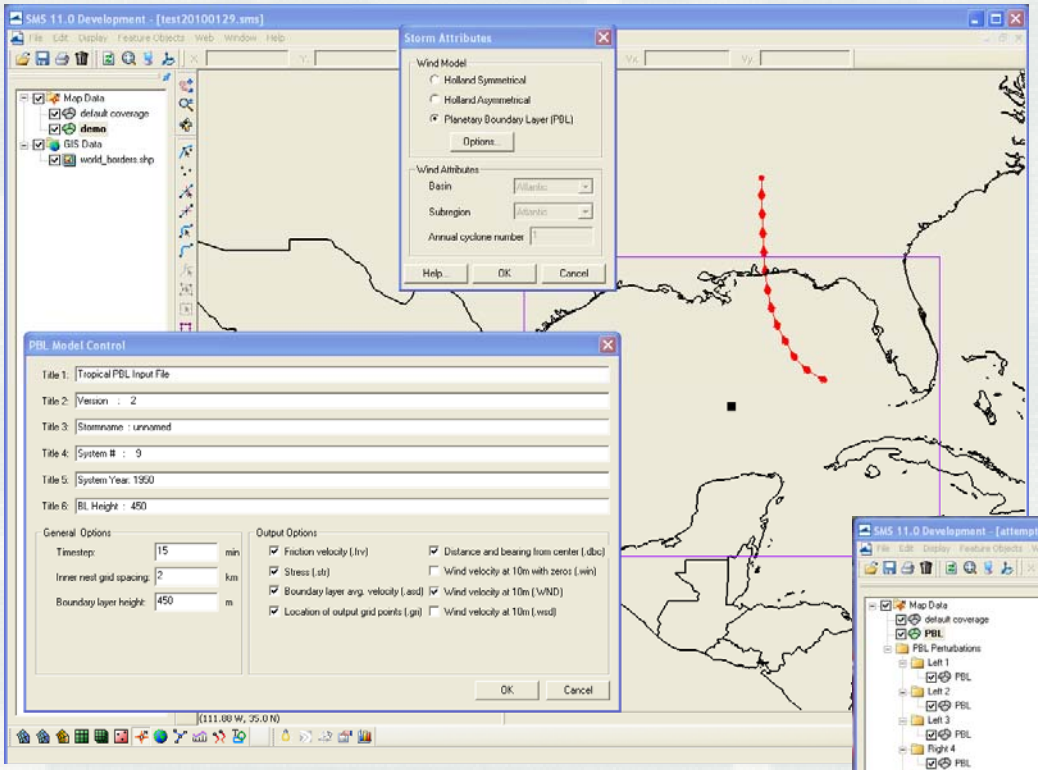


1. Support for MORPHOS-PBL Cyclone Model*, ADCIRC's internal Holland models and **ATCF Best Track** formats
2. Ability to read/modify existing cyclone track and characteristics
3. Ability to create cyclone track via "point-n-click" and add storm characteristics
4. Ability to auto perturb cyclone data:
   - **Track**
   - **Speed**
   - **Intensity**
   - **Size**

Note: NOAA uses the ATCF Best Track.

*Updated version of TC96

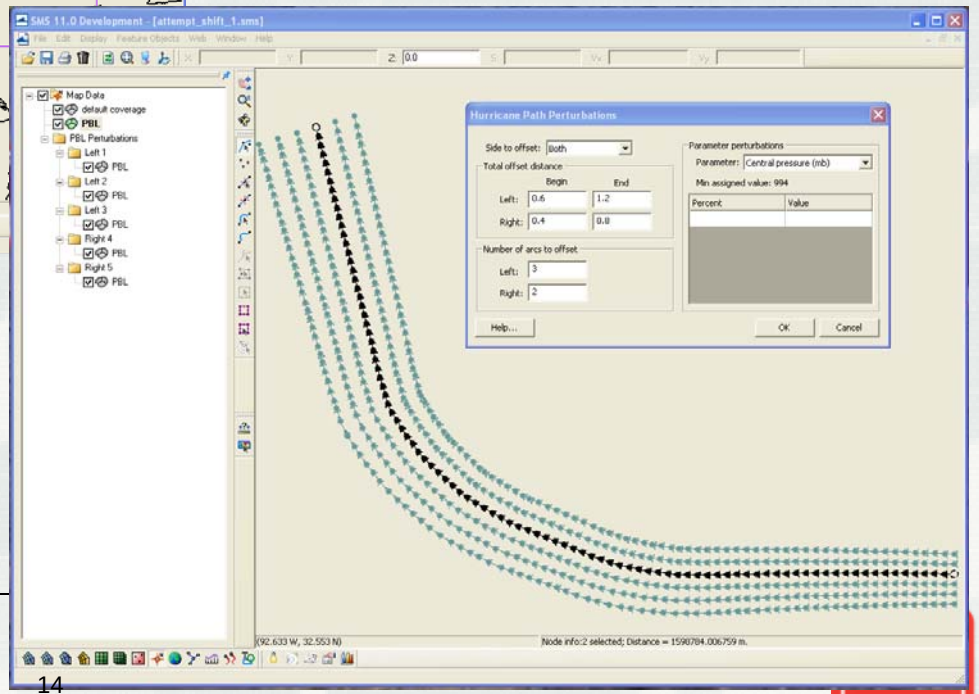
SMS GUI for Cyclone Models



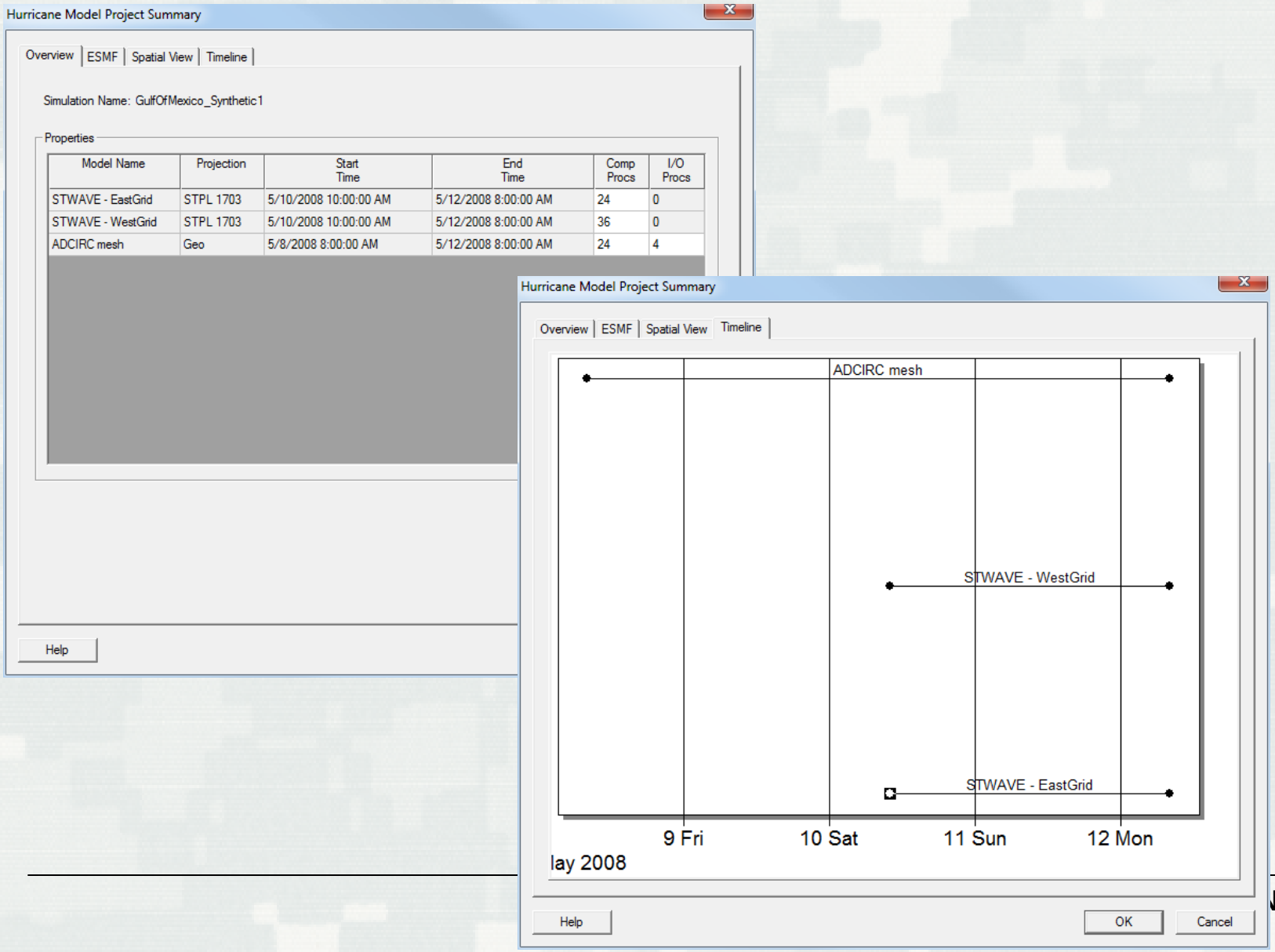
Setup and run the MORPHOS-PBL Cyclone Wind Model*

*Updated version of TC96

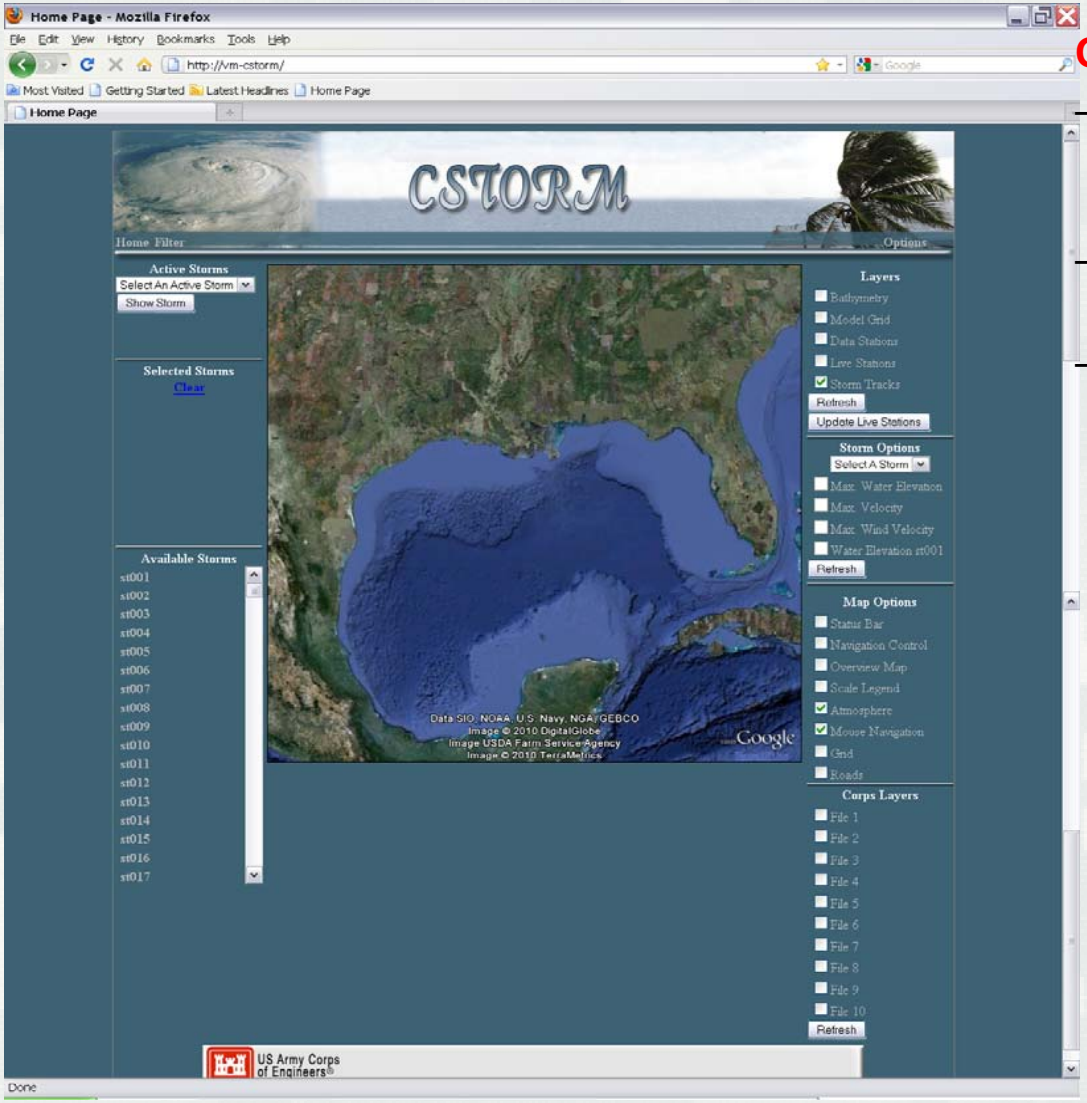
Easily create perturbations for storm track/characteristic.



Project Management Summary View



Coastal Storm - Database and Data Mining Tool



Goals

- Develop long-term archive/database of measured and modeled coastal storm data
- Make data easily accessible and understandable to team members
- Integrate contextual data products and tools that support federal decision making
  - Emergency management
  - Risk management /assessment/communication
  - Project design and evaluation

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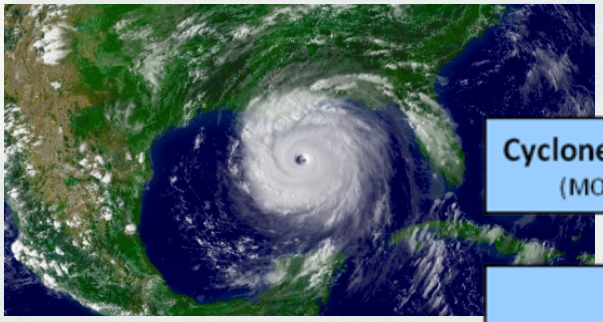
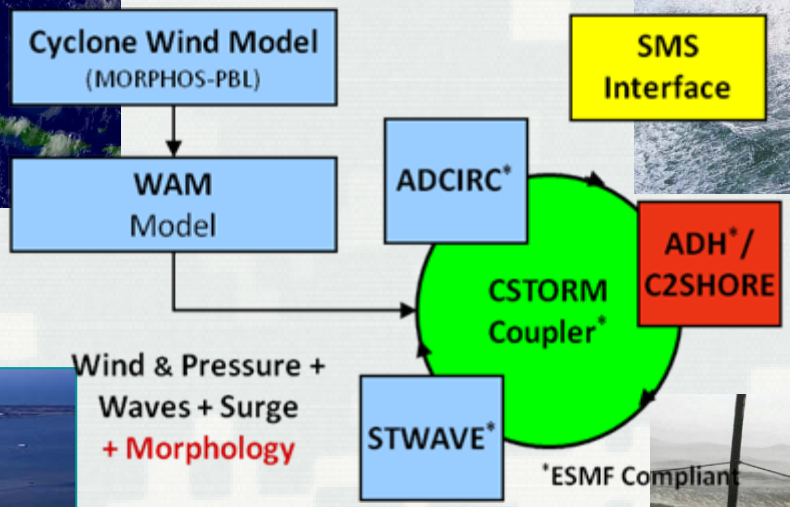
CSTORM-MS Summary

- **Expandable**
- **Upgradeable**
- **Multi-Scale**
- **Multi-platform PC to HPC**
- **More than Hurricanes**
- **Relocatable to your study area**





Spiral 2 – Oct 2012

Next Generation Workflow

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